

### REMARKS

Favorable reconsideration of this application in light of the above amendments and the following remarks is respectfully requested.

Claims 1-17 are pending in this application. Claims 1, 7-8, 11 and 16-17 are amended herein. No claims have been allowed. Claims 7-8 and 16-17 are objected to.

#### *Claim Rejections - 35 U.S.C. § 103*

1. The Examiner has rejected claims 1-4, 6, 9-13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Kanata (U.S. Patent No. 5,667,923) in view of Hirayanagi (U.S. Patent No. 6,180,289).

Kanata (abstract and cover figure) teaches a direct write charged particle beam exposure method for exposing a resist layer. The method divides exposure patterns into small regions. Charged particle beam exposure doses within the small regions are adjusted to compensate for backscattering from a patterned layer underlying selected portions of the resist layer.

Hirayanagi (abstract and cover figure) teaches a projection microlithography mask and mask substrate separate therefrom. The projection microlithography mask and mask substrate may be employed with a charged particle beam exposure method.

Within the paragraph bridging pages 2-3 of the office action made FINAL, the Examiner reads Kanata onto applicant's foregoing claims. At page 3, last paragraph, of the

office action made FINAL, the Examiner further concludes that Kanata teaches most elements in applicant's foregoing claims to applicant's invention.

At page 4, first paragraph of the office action made FINAL, the Examiner acknowledges that Kanata does not teach a charged particle beam method employing a series of adjacent fractured pattern elements when forming a contiguous latent pattern, where an adjacent pair of pattern elements is separated by a gap. Rather, at page 4, second paragraph of the office action made FINAL the Examiner cites Hirayanagi as teaching that feature of applicant's invention. In particular, the Examiner cites that a gap is formed by Hirayanagi's retention member as disclosed at Fig. 1c and col. 2, lines 5-10.

Within the paragraph bridging pages 4-5 of the office action made FINAL, the Examiner first notes that the foregoing references are analogous art since they are drawn to charged particle beam methods. The Examiner asserts that it would have been obvious "to use the mask of Hirayanagi in the method of Kanata, as the mask of Hirayanagi can be employed without direct writing which allows for relatively high wafer throughput and decreased costs." The Examiner also predicates reasonable expectation of success in using the mask of Hirayanagi, "as Kanata [at col. 3, lines 20-22] teaches that the charged particle beam method is performed with a mask."

Within the Response to Arguments of the office action made FINAL, the Examiner further cites Hirayanagi at col. 3, lines 5-7 as teaching that "mask reticles are mask subfields, where each subfield comprises a respective portion of the overall pattern to be transferred from [a] mask to [a] substrate." The Examiner further asserts that "each subfield, or mask reticle, is a fractured pattern element," in accord with applicant's claimed invention.

In response in a first instance, applicant notes that within proper context, Kanata at col. 3, lines 20-22 probably does not teach that “[a] charged particle beam method is performed with a mask,” as asserted by the Examiner. Rather, Kanata at col. 3, lines 20-22 specifically teaches “a block exposure method which copies a repetition of complex patterns formed on a mask collectively. . . .” Applicant thus understands Kanata at col. 3, lines 20-22 to teach that a block exposure method exists for proximity effect correction within direct write charged particle beam exposure methods. The block exposure method copies a repetition of complex patterns on a mask. However, there is no indication within Kanata that a mask is physically employed as an optical element within a direct write charged particle beam exposure method such as Kanata’s method. Rather the mask is employed as a data source for complex patterns, repetitions of which are copied within the block exposure method. Thus, within proper context, Kanata does not apparently teach that “[a] charged particle beam method is performed with a mask.”

In response in a second instance, applicant has amended claim 1 and claim 11 to incorporate therein a limitation that applicant believes to assist in distinguishing applicant’s invention from that which is taught within Hirayanagi. In particular, applicant has amended claim 1 and amended claim 11 to claim that applicant’s charged particle beam method is a direct write charged particle beam method. Support for this limitation newly incorporated into claim 1 and claim 11 is found within applicant’s specification at paragraph 0034. Within paragraph 0034, a person skilled in the art would understand that shaped electron beams, raster scanning methods and vector scanning methods as applied to electron beam methods are implicitly descriptive of direct write electron beam methods.

Given the foregoing limitation newly incorporated into claim 1 and claim 11, applicant next asserts that Hirayanagi may not properly be employed for rejecting any of applicant's claims to applicant's invention since Hirayanagi, when considered in its entirety, teaches away from applicant's claimed invention. MPEP 2141.02. In particular, applicant's claimed invention is directed towards a direct write charged particle beam exposure method while Hirayanagi's invention (title and abstract) teaches a masked projection lithography method which may employ charged particle beam radiation. Since direct write charged particle beam methods typically inherently do not employ a mask as an optical element, while projection lithography methods do employ a mask as an optical element, Hirayanagi teaches away from applicant's claimed invention with respect to the presence of a mask as an optical element within a charged particle beam method. Given that Hirayanagi thus teaches away from applicant's claimed invention with respect to the presence of a mask as an optical element within a charged particle beam method, applicant asserts that Hirayanagi may not properly be employed in rejecting any of applicant's claims to applicant's invention.

The "prior art must be considered in its entirety, including disclosures that teach away from the claims." MPEP 2141.02 (paraphrasing *W.L. Gore & Associates, Inc. v. Garlock, Inc.* (citation omitted))

In response in a third instance, applicant has further amended claims 1 and 11 to incorporate therein an additional limitation that applicant believes to assist in patentably distinguishing applicant's invention from that which is taught within Kanata and Hirayanagi as combined by the Examiner.

In that regard, applicant has also amended applicant's claim 1 and claim 11 to claim that applicant's series of adjacent fractured pattern elements is a series of direct write charged particle beam shot fractured pattern elements. Support for this limitation newly incorporated into claim 1 and claim 11 is found within applicant's specification at paragraph 0045-0046 and figures 5a-5b.

Applicant again notes that the Examiner relies upon Hirayanagi at Fig. 1(c) and related portions of Hirayanagi's specification for teaching a retention member 12 that provides a gap interposed between a pair of mask reticles 11a and 11b. The Examiner further asserts that the pair of mask reticles 11a and 11b comprise a series of fractured pattern elements. While the Examiner's assertion with respect to Hirayanagi's pair of masks 11a and 11b comprising a series of fractured pattern elements within the context of applicant's invention may have some merit prior to amendment of claim 1 and claim 11, such assertion appears inapplicable to claim 1 and claim 11 as newly amended. In particular, the Examiner acknowledges that Kanata does not teach fractured pattern elements within a direct write charged particle beam method. Instead, the Examiner relies upon Hirayanagi for teaching fractured pattern elements as they are present within a pair of mask reticles 11a and 11b separated by a gap and fixed to a retention member 12. Since applicant has amended claim 1 and claim 11 to claim applicant's fractured pattern elements as being direct write charged particle beam shot fractured pattern elements separated by a gap, applicant asserts that each and every limitation as disclosed and claimed within claim 1 and claim 11 is not taught within Kanata and Hirayanagi as combined by the Examiner. MPEP 2143.03. Hirayanagi's mask reticle based fractured pattern elements separated by a gap are simply clearly not equivalent to applicant's direct write charged particle beam shot fractured pattern elements separated by a gap.

“To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.” MPEP 2143.03 (citing *In re Royka* (citation omitted)).

Thus, since each and every limitation within applicant’s invention as disclosed and claimed within claim 1 and claim 11 is not taught within Kanata and Hirayanagi as combined by the Examiner, in particular with respect to a teaching of direct write charged particle beam shot fractured pattern elements separated by a gap, applicant asserts that claim 1 and claim 11 may not properly be rejected under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi. Since all remaining claims within the foregoing rejection are dependent upon claim 1 or claim 11 and carry all of the limitations of claim 1 or claim 11, applicant additionally asserts that those remaining claims may also not properly be rejected under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi.

Finally, in response in a fourth instance, applicant also asserts that there is no suggestion or motivation for modification or combination of Kanata with Hirayanagi in the fashion as suggested by the Examiner, nor any reasonable expectation of success of such modification or combination, since the Examiner’s proposed modification changes the principle of operation of Kanata. MPEP 2141.01, 2141.02.

Specifically, applicant again notes that applicant’s claimed invention and Kanata’s disclosed invention each teach direct write electron beam methods. In comparison, Hirayanagi’s disclosed invention teaches a projection lithography method that employs a mask, and that may employ charged particle beam radiation. Since Kanata teaches a direct write charged particle beam method, Kanata inherently has no need for Hirayanagi’s fractured pattern

67,200-447; TSMC 00-0890  
Serial Number 09/975,855

element mask and retention member since within a direct write method charged particle beam exposure locations are defined employing a scanning of a charged particle beam source with respect to a substrate, rather than by a mask. Thus, the incorporation of Hirayanagi's fractured pattern element mask and retention member into Kanata's direct write charged particle beam would change the principle of operation of Kanata's direct write charged particle beam method. Such a mask if employed within the context of Hirayanagi's invention would serve a masking function that is provided within Kanata's invention by a selective scanning of a charged particle beam with respect to a substrate.

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." MPEP 2143.01 (citing *In re Ratti* (citation omitted)).

Since the modification or combination of Kanata with Hirayanagi as suggested by the Examiner would change the principle of operation of Kanata from a purely direct write charged particle beam method absent a mask to newly include a mask that would instead provide a function intended by the direct write method, applicant asserts that there is no suggestion or motivation for modification or combination of Kanata with Hirayanagi. For the same reason relating to a change in the principle of operation of Kanata, applicant also asserts that there is no likelihood of success of the combination of Kanata with Hirayanagi.

Given the absence of suggestion or motivation for modification or combination of Kanata with Hirayanagi, and the unlikelihood of success of such combination, applicant asserts

67,200-447; TSMC 00-0890  
Serial Number 09/975,855

that none of applicant's claims to applicant's invention may properly be rejected under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi.

In light of the foregoing responses, applicant respectfully requests that the Examiner's rejections of claims 1-4, 6, 9-13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi be withdrawn.

2. The Examiner has rejected claims 5 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi and further in view of Ausschnitt (U.S. Patent No. 5,629,772).

Ausschnitt is cited as teaching a positive photoresist. The Examiner at page 5, third paragraph of the office action made FINAL acknowledges that the same is absent within Kanata in view of Hirayanagi. The Examiner at page 5, last paragraph of the office action made FINAL rationalizes suggestion or motivation for modification or combination of Kanata in view of Hirayanagi with Ausschnitt upon Ausschnitt's teaching "that it is common in the art to use both negative and positive resists in lithographic exposure processes."

In response, applicant predicates patentability of claims 5 and 14 upon their dependence upon claims 1 and 11.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejections of claims 5 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Kanata in view of Hirayanagi and further in view of Ausschnitt be withdrawn.



***Allowable Subject Matter***

The Examiner has objected to claims 7-8 and 16-17 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In response, applicant has amended claims 7-8 and 16-17 to incorporate therein the limitations of claims 1 or 11, thus providing claims 7-8 and 16-17 as independent claims.

***Other Considerations***

The Examiner has cited no additional prior art of record not employed in rejecting applicant's claims to applicant's invention. A fee is due as a result of this amendment and response. A Credit Card Payment form in the amount of \$258 is attached hereto

**SUMMARY**

Applicant's invention as disclosed and claimed within claims 1, 7-8, 11 and 16-17 is directed towards a method for forming a patterned resist layer or a method for forming a photomask. Each of the methods employs a charged particle beam exposed resist layer having a contiguous latent pattern formed employing a series of adjacent fractured pattern elements, at least one pair of which is separated by a gap. The methods are direct write charged particle beam methods and the series of adjacent fractured pattern elements are direct write charged particle beam shot fractured pattern elements. The same are absent within the prior art of record. Also absent is a suggestion or motivation to combine the prior art to provide the applicant's invention.

67,200-447; TSMC 00-0890  
Serial Number 09/975,855

### **CONCLUSION**

On the basis of the above amendments and remarks, reconsideration of this application, and its early allowance, are respectfully requested.

Any inquiries relating to this or earlier communications pertaining to this application may be directed to the undersigned attorney at 248-540-4040.

Respectfully submitted,

A handwritten signature in black ink, appearing to be "Randy W. Tung", written over a horizontal line.

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